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DEVELOPMENT OF THE PRODUCTIVE FORCES OF EASTERN SIBERIA

MACHINE BUILDING

- USSR -

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MACHINE BUILDING

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## **BASIC TRENDS AND PROBLEMS OF THE DEVELOPMENT AND DISTRIBUTION OF THE MACHINE-BUILDING INDUSTRY OF EASTERN SIBERIA**

Portion of an article by Academician V. I. Dikushin and Candidate of Economic Sciences M. G. Shkol'nikov of the Council for the Study of Productive Forces, Academy of Sciences USSR, pages 16-25. NOTE: Shkol'nikov's initials are also given in source, page 116, as "G. M."<sup>7</sup>

### Specialization, Cooperation and the Technical Standards of the Machine-Building Industry of Eastern Siberia

The machine-building industry of Eastern Siberia combines conditions favorable for the specialization of production of complete machines, portions thereof, and machine parts, and of the stages of technological processes and auxiliary industries. Such specialization must provide for a maximum concentration of similar productions and similar processes and, consequently, the feasibility of the most progressive organization of production, the optimum utilization of capacities, the employment of the most productive technology, a rational utilization of trained personnel, and an extensive production cooperation within and between the individual branches of the machine-building industry.

The list of branches which are to constitute the prospective machine-building industry of Eastern Siberia predetermines an appreciable development of specialization of small-scale production of finished heavy and chemical machines and of hoisting, transportation, construction, road-building, metal-working and wood-working equipment. In all these instances it is expedient to concentrate the production of similar articles in one or two plants with a possible centralization of preforming operations for groups of industrial establishments. It is feasible to organize common industrial casting and forging bases for a group of heavy machine-building plants, as well as for chemical, paper, and other machine-building groups in Eastern Siberia.

The above-mentioned branches can centralize their stamping and forging of similar parts of boiler-making and welding operations and, in individual instances, even the machining of especially bulky parts for groups of factories. Such an organization stipulates an intensive development of cooperation within the groups of plants even in the piece and small-scale production branches.

For large-scale production (certain types of machine tools, electrotechnical, agricultural, and other equipment) it is quite feasible to organize common preforming bases for a group of plants and centralize the production of special tools, fastenings, plastic articles, etc.

It is expedient to develop automobile building and other mass production enterprises as a group of small specialized assembly and machine-part plants located close to the sources of metal, wood, plastics, tires, etc., and supplementing the automobile assembly plant and not as large complex plants. A bearing plant, auxiliary equipment plants, as well as a preforming forge, press and casting plants are also included in such a complex industrial group.

Certain industries related to the automobile industry, such as die and attachment plants or plants for production of non-standard equipment, should be built with a view of the requirements of other branches of machine building. Repair shops for the technical equipment should be planned as plants serving the entire region.

The centralization of the mass production of articles (gears, electrodes, fastenings, electrical equipment, driver's tools, spare parts, etc.) should attain the greatest development in Eastern Siberia.

The introduction of progressive forms of specialization requires that, in addition to a scientifically based plan of development and distribution of the machine-building industry, a combined plan be developed for production cooperation between the industries of Eastern Siberia.

Cheap resources of electric power afford the introduction of radical changes in the procedure of many production processes of machine-building industries, beginning with the preforming shops and ending with the mechanical and assembly plants. The high-temperature production processes can be the first to change over to electricity. In the heat shops electricity can be substituted for all types of fuels in smelting, heating, welding, and heat treatment of metals.

Introduction of electric heating of the blast in coke cupola furnaces, which reduces the consumption of coke and lowers the cost of casting, and even the substitution of electric smelters for cupola furnaces in the casting shop, has a very promising future. In this procedure the thermal efficiency increases to 50-60%, as against 20-25% in ordinary cupola furnaces and 40-50% in furnaces with heated blast. The temperature of molten iron can be brought to any required level, the burning losses of the elements are reduced to a minimum, and the amount of rejects is sharply reduced. The electrical drying of molding materials, molds, cores, laddles for molten metal, modeling wood, the electrical heat treatment of castings, etc., should be introduced here.

Electrification of heating and stamping processes can be performed with high effectiveness when crankshaft forging presses are substituted for steam and pneumatic drop hammers. This yields 15-20% economy in metal owing to the decrease of allowances for machining, an appreciable increase in labor efficiency, a 20% decrease in the cost of forging, a distinct improvement in working conditions (absence of smoke, soot, carbon dioxide and noise of hammers). A manifold utilization of electricity as the source of motor power will be beneficial for the combined mechanization and automation of the production processes (including the auxiliary processes), the broad introduction of the most advanced types of automated multimotor power drive and automatic flow lines based thereon.

Electrical heating of billets on the presses significantly increases the work efficiency and quality indexes of production. Heating of billets by the induction method instead of heating in economical fuel-heated furnaces is effective when the cost of electric power is below 4.5 kopeks per kWh, and by the contact method even when the cost is 10-12 kopeks per kWh. Since the cost of electricity in Eastern Siberia will be appreciably lower, the economic advantages of using electricity as the source of energy in the thermal shops in place of solid, liquid, or even gaseous fuel are quite obvious.

Compared to other sources of energy, electricity offers a number of technical and economical advantages in the heat treatment of machine parts, normalization and annealing of forging products and castings, temper hardening, casehardening, welding of machine parts by various methods, and other operations.

Complete electrification of the technological processes in the thermal shops of machine-building plants decreases the labor force by 33-50% and is an important prerequisite for the improvement of the quality of the products of the preforming shops. In addition, it is an essential factor in attaining a great economy in metal and the automation of machine-parts production.

Inasmuch as in the prospective structure of the branches of the machine-building industry in Eastern Siberia the major portion will be occupied by such industries (metallurgical, mining and chemical equipment, automobile building, etc.) which are characterized by a broad development of thermal processes that consume 30-50% of the total number of all types of energy used, the electrification of these processes, and the subsequent increase in labor productivity in view of the scarcity of labor available in Eastern Siberia, is highly significant in the development of machine-building industry.

Electrochemical processes (electrolytic polishing, pickling, electroplating, anode-mechanical grinding, and others) and electrical erosion methods of treatment should be widely propagated in Eastern Siberia. The machine-building plants that are being built must constitute complexly mechanized establishments with electrified transportation and storage facilities, in addition to the electrification of the production processes.

#### Distribution of the Machine Building Industry Throughout Eastern Siberia

The bulk of the present-day metalworking industry of Eastern Siberia is located mainly in the oblast and kray centers of the Trans-Siberian Railroad. The projects of construction of new machine-building enterprises are usually based on their distribution in large cities. In developing the regional planning of Irkutskaya Oblast and Krasnoyarskiy Kray, and taking into consideration the overloading of these cities with industries, the Giprogor (State Institute of Planning the Mining Industry) plans the location of an appreciable portion of the new machine-building plants in thinly populated places, mainly on the Siberian Railroad trunk

line. Many of these settlements exhibit the conditions necessary for such allocation and can in the future develop into appreciable machine-building centers.

In addition to this regional planning project developed by Giprogor in 1957 for the area served by the Krasnoyarsk GES (Hydroelectric Station), the location of many new machine-building, metalworking and repair-mechanical plants had been tentatively marked on the Krasnoyarsk Railroad, which carried the greatest load in the country, and this fact would have brought about an excessive concentration of machine-building enterprises in the given region.

The planners had not taken into account the extremely advantageous conditions for distribution of machine building throughout other regions of Eastern Siberia, especially those located south of the Siberian trunk line. Khakassiya and the Minusinsk Depression, areas of the Buryatskaya ASSR along the Ulan-Ude-Naushki Railroad, the southeastern areas of Chitinskaya Oblast (in the triangle between the Siberian trunk line, the Karymskaya-Otpor Railroad and the Argun' River) exhibit better natural conditions as compared to the northern regions and are more thickly populated. While the Khakassiya-Minusinsk region occupies less than one fourteenth of the territory of Krasnoyarskiy Kray, more than one third of its population is concentrated there.

The principal agricultural bases of Eastern Siberia, which manifest all the necessary natural conditions for growing diverse farm products, for an appreciable development of livestock raising, and the creation of foodstuff bases that would provide for the economic development of the regions on any scale are concentrated in the above mentioned regions. The Khakassiya-Minusinsk region and the regions of the Buryatskaya ASSR even now have the best transportation system in Eastern Siberia. The long-range plans of economic development of these regions, creation on their territory of new industrial enterprises requiring machinery and of large metallurgy and fuel-energy centers are highly significant. An important prerequisite for locating the machine-building enterprises in the Trans-Baykal regions is their disposition along the railroad trunk lines leading into the Asiatic people's democracies, and their relative proximity to these countries. All these conditions create extremely weighty arguments for situating the machine-building enterprises in the regions indicated, where at the present time they are virtually nonexistent.

A limited number of metal-shaping branch industries reflecting the most important needs of the given region and primarily those industries connected with the principal national-economic specialization of the region and supplied by the local sources of raw materials must be developed in each of the administrative-economic regions of Eastern Siberia. As a rule, the establishment in each economic region of complex machine-building groups which have many branches and duplicate one another must be avoided. Therefrom arises the necessity for sharp differentiation in the machine building specialization of each region.

The development of the sources of ferrous metallurgy will promote a wide decentralization of machine building in Eastern Siberia.

Preliminary, scientifically based deliberations lead to the long-range plans for the construction of a number of metallurgical plants at various locations in Eastern Siberia, Krasnoyarskiy Kray, Irkutskaya and Chitinskaya Oblasts, and southern Yakutiya. The metal consuming capacity of Eastern Siberian machine-building industry favors locating the machine-building establishments near these metallurgical plants, taking into account the assorted metals produced by each one of them, thereby not only lowering transportation costs but also ensuring the optimum conditions of metal supply and in many instances permitting the adaptation of the production of ferrous metals to the requirements of the machine-building industry.

The fuel and electrical energy resources of Eastern Siberia, especially in its western sector, ensure the most extensive possibilities for a maximum electrification of the machine building processes.

The unlimited resources of timber in the territory of Eastern Siberia, the favorable prospects for the development of diversified chemical industry (plastics, synthetic rubber, etc.) in Krasnoyarskiy Kray and Irkutskaya Oblast, and the prospects for a large production of light and nonferrous metals expand appreciably the source of raw materials for machine building in Eastern Siberia and make it rich and extremely diversified.

An appraisal of the economic and natural factors and conditions for the distribution of the machine-building industry in Eastern Siberia shows that the establishments for the production of equipment for the metallurgical, mining, chemical, power, and other branches of heavy industry must be located mainly in the western sector of Eastern Siberia, in the Angara-Yenisey region. This reasoning is dictated primarily by the fact that the country's largest diversified combined aggregate of heavy industrial establishments, based on the now developing Central Siberian electric-power network and a powerful source of fuel, is developing progressively on the territory of Central Siberia which embraces the Kuzbass and the Angara-Yenisey region. The expediency of such distribution of the leading branches of the machine-building industry is also favored by the development of ferrous metallurgy, a diversified chemical industry, and the production of light and nonferrous metals in this region.

The production specialization of the machine-building industry of the Trans-baykal area will be developed along the lines of machine-tool building, hoisting, transportation, and road building equipment and farm machinery and electric-equipment production, in particular, the electric locomotive, motor vehicles, and tractor building.

The technical and economic advantages of the disposition of machine-building plants in groups according to the similarity of equipment, production cooperation, mutual supply and other conditions are well known. Transportation and production connections are thereby developed in the most rational way, and it becomes possible for a group of enterprises to be served by the same power, transportation and economic sources. The best utilization of raw material resources, the

organization of pre-forming and tool industries, and the creation of common experimental and engineering bases can be thus achieved, and lastly, an appreciable economy in the labor force, capital, and production expenses can be attained. From this point of view the long-range planning by Giprogor for the location of machine-building industry in the regions served by the Krasnoyarsk, Bratsk, and Irkutsk hydroelectric stations merits attention. However, as it was mentioned earlier, this planning is characterized by an excessive concentration of machine-building enterprises in certain regions of the western sector of Eastern Siberia. The expediency and feasibility of decentralization of the machine-building industry through the utilization of other, very convenient territories was not taken under consideration.

Let us examine the conditions for the distribution of certain leading branches of machine building in Eastern Siberia.

#### Production of Mining, Ore Concentration, and Metallurgical Equipment.

At the present time this branch of machine building is represented by two heavy machine-building plants. One of them manufactures equipment for cranes, petroleum equipment and, during recent years, crushing, grinding, and furnace equipment for the aluminum and cement industry; the other produces separate types of equipment for ferrous and nonferrous metallurgy, ore-concentration equipment, and dredges. The production of mining equipment is also concentrated in two plants. The major portion of the production is either shipped beyond the boundaries of Eastern Siberia or exported abroad.

The further growth of these enterprises (the productive capacity of Sibtyazhmash [Siberian Heavy Machine Building] is planned to be increased by 100-200% and even 300%), the development of their production specialization, the rational utilization of their capacities will permit a radical expansion of the basis of heavy and mining machine-building industry in Eastern Siberia. At the same time, taking into account the dimensions of the forthcoming industrialization of the Eastern regions and the insufficient basis for heavy machine building there, the necessity arises for the construction of new establishments of this branch of industry. The imminent growth of ferrous and nonferrous metallurgy requires an increase in the production of metallurgical equipment which would exceed the prewar production by several hundred percent.

Taking into account the scales of the future growth of the coal industry and its mechanization, of mining operations connected with ferrous and nonferrous metallurgy, polymetallic and gold industry, and the production of non-metallic minerals, the planning organizations make tentative plans for the production in Siberia of medium and heavy excavators, equipment for open-pit mining (waste-product removers, waste-dump bridges, abzetsers [?], etc.), crushing, grinding, and concentration equipment. Therefore, it appears expedient to situate the production of metallurgical and concentrating equipment, and of

large excavators within the area served by the Krasnoyarsk GES (Hydroelectric Power Station), close to the future metallurgical plant. The proposed region is the best for situating such establishments, inasmuch as the latter, in addition to their proximity to a metallurgical plant, would be located in the center of Siberian heavy industry which uses its products.

#### Chemical Machine Building

In order to supply the requirements of the chemical and allied branches of industry (oil refining, hydrolysis, wood-pulp chemistry, etc.) for mechanical equipment during the planned 7-year period (1959-1965) its production by 1965 must increase more than 4.5 times, which signifies an annual increase of 1.2-1.4 times in this branch of machine building. This program of development of chemical machine building requires the construction of new establishments in addition to an appreciable expansion of the existing ones. Central Siberia where the country's largest base of chemical industry is developing on a very large scale must hold an important position in the realization of this program. Its requirements for machinery will constitute over 10% of the national requirements for chemical equipment even during the coming 7-year period.

One of the large repair-mechanical plants can be used to supply the needs of the chemical industry of the Irkutsk economic region. The reconstruction and expansion of this plant is merely the beginning of the creation of Central Siberia's own machine-building base for chemical industry.

The extremely favorable prospects for further growth of all the branches of chemical and related industries of Central Siberia will require the construction of new chemical machine building establishments after 1965. The powerful diversified chemical industry of Central Siberia should have its own machine-building base consisting of a number of establishments located in Western and Eastern Siberia. Evidently a number of chemical-equipment plants (technological, pump, compressor, and fittings) will have to be constructed and situated as near as possible to the sources of raw materials (primarily metal) and to the consumers. Therefore, the proposals of Giprogor on the following location of two large machine building groups appear to be well substantiated: One on the Trans-siberian trunk line is to consist of three compressor and chemical machine building plants, and the other one is to be composed of four plants for the production of chemical and paper making equipment. The metallurgical base for these groups, which will require up to 170,000 tons of metal per year, will be the Tayshet Metallurgical Combine (Kombinat). The necessity arises for the construction in Irkutskaya Oblast, possibly in the Usol'ye region which is a very promising and large center of chemical industry in the east, of a group of establishments of chemical machine building based also on this metallurgical combine.

### Motor-Vehicle Building Industry

According to the hypothesis proposed by the Giproavtoprom (State Institute of Planning the Motor Vehicle Industry) the development of the motor vehicle industry in Eastern Siberia must proceed in three stages by means of a gradual construction of three groups of motor vehicle industry: The Western Siberian (1959-1970), the Eastern Siberian (1962-1975), and the Far Eastern (mainly after 1975). In Eastern Siberia a group of establishments must be created with a total output of about 10% of the entire production of the Union (the over-all output of Siberia and the Far East to equal about 20% of the total production). This group is to be composed of approximately 30-35 auto-assembly, unit, machine-part, pre-forming, and bearing plants, as well as auxiliary equipment plants.

Taking into account the plans developed by the Girpogor, the tentative plan of the Giproavtoprom for locating the two truck and one automobile assembly plants, with the corresponding groups of unit and other plants, near the raw material supply bases in Krasnoyarskiy Kray, Irkutskaya Oblast and Eastern Zabaykal'ye appear to be well founded. Special attention should be given to the Abakan-Minusinsk region as the site of future motor vehicle plant which eventually will become the center of a group of metallurgical plants (Kuznetsk, Western Siberian, Achinsk, and Tayshet) and be near the sources of other types of raw materials and large sources of power with exceptionally good means of transportation.

### Machine-Tool Building

The proposals made by the Giprostanok (State Institute for the Planning of Machine Tool Industry) include tentative plans for the construction in Eastern Siberia of plants for the production of metal-cutting and woodworking machines, forging, press, and casting equipment, tool-making, abrasive and auxiliary equipment (hydraulic and electrical apparatus, etc.) in addition to the reconstruction of four operating plants. The production of these items in Eastern Siberia will constitute approximately 14% of the over-all national production (about 20% of the entire national output is to be produced in Siberia and the Far East).

In accordance with the Girpogor planning the machine-tool industry establishments should be located in groups in Krasnoyarskiy Kray (group of the metal-working machine plants), in Irkutskaya Oblast (group of woodworking machine plants), as well as in groups and individual establishments in the Khakassia-Minusinsk Depression, and in the Transbaykal territory.

### Electric-Equipment Industry

At the present time three small establishments of this industry are located in Eastern Siberia and three groups of electric-machinery

building establishments in Western Siberia.

According to the recommendations of the Giproenergoprom (State Institute of Planning the Power Industry), it is advisable to build two groups of plants in Eastern Siberia along with the further wide expansion of the electric-equipment industry in Western Siberia.

Giprogor makes tentative plans for the disposition along the Krasnoyarsk Railroad of a single group consisting of five plants producing electric motors, power transformers, high-voltage apparatus, electrothermal equipment, and cable and insulation materials. The future extreme overloading of the cities and other populated places in the area of this railroad with industrial plants, including machine-building plants, induces us to investigate the problem of distribution of this group of plants in other areas, and of these, upon consideration of all the aspects, the Abakan-Minusinsk area merits the greatest attention.

The second group of plants recommended by the Giproenergoprom consists of plants producing turbo-generators and large machines, electric motors up to and above 100 kw, low-voltage apparatuses, electric welding equipment, lighting fixtures, regulators, and insulating materials. It may prove advisable to locate this group in the Ulan-Ude region. The advisability of conversion of the Ulan-Ude Locomotive and Railroad-Car Repair Plant to production of electric locomotives is to be examined.

#### Agricultural-Machinery Building

At the present time this branch of machine building is represented in Eastern Siberia by a combine harvester plant.

According to the long-range plans, the requirements of Eastern Siberia will attain 6% of the national production of agricultural machinery and 2-4% of the tractor production. The economic advisability of creating Eastern Siberia's own network of plants is determined by the fact that at the present time about 20,000 various machines which form a major portion of the entire present day consumption are shipped in from a distance of 4,000-5,000 kilometers.

According to the data of VISKhOM (All-Union Institute of the Agricultural Machines) it is advisable to build in Eastern Siberia one tractor plant and several farm-machinery construction plants. This group of establishments will represent a portion of the combined industrial net producing agricultural machinery in the regions east of the Urals.

This group of plants will require annually approximately 760,000 tons of metal, a labor force of 37,800 men, and capital of 1,200,000,000 rubles invested in construction. It is expedient to situate this group of plants in regions south of the Siberian trunk line.

#### Conclusions and Recommendations

1. Approximately 75% of all machines built in Eastern Siberia are shipped out beyond its boundaries, owing to the narrow specialization

of the large machine-building plants, the products of which are used all over the country. Over 80% of the entire consumption of machinery in Eastern Siberia consists of equipment mostly shipped in from the European areas of the country and the Urals.

2. The young machine-building industry of Eastern Siberia, by the capacity of its plants, their technical standards, and the qualifications of the trained personnel, and notwithstanding the relatively limited number of plants, the incomplete state of many of them, and the frequently inefficient utilization of their productive capacities, constitutes a solid base for the future machine-building center which would to a large extent fill the requirements of the future national economic specialization of this area.

3. In order to create this machine-building base the rate of progress of the machine-building development in Eastern Siberia in the future must leave behind the progress of the other eastern areas of the country. With machine building in the USSR increasing 4-5 times, machine building east of the Ural must increase about 10 times, and in Eastern Siberia 15 times; and, as a result, the percentage of the machine-building production of Eastern Siberia will attain 5% and more of the all-Union production of machines.

4. Machine building in Eastern Siberia, which is an integral part of the Eastern machine building system in its development, must be closely correlated with the problems facing this system. In the course of its development the machine building of Eastern Siberia is composed of establishments which correspond to the greatest extent to the requirements of its national economy and at the same time are correlated with the presently existing branches of machine building. Here the plants are built for the production of certain types of equipment for the metallurgical, mining, chemical, timber, metalworking, woodworking, and paper industries, for construction and road building work, hoisting and transportation equipment, agricultural and transportation machine building. Eastern Siberia manifests favorable indications for the development of new branches of machine building, such as motor vehicle building, certain types of electric power machinery building, and electrical engineering industry.

5. At the present time the machine-building plants of Eastern Siberia are mainly concentrated in the oblast and Kray centers. The newly created machine building establishments must be located in the settlements along the Transsiberian trunk line which have the necessary factors for the development of machine building and are situated near the metallurgical plants. Appreciable opportunities for the location of machine-building centers and individual plants are presented by regions south of the Transsiberian trunk line, namely Khakassiya and the Minusinsk Depression in Krasnoyarskiy Kray, the southeastern sector of Chitinskaya Oblast and regions of the Buryatskaya ASSR adjacent to the Ulan-Ude--Naushki Railroad. These regions have great advantages over more the northerly regions of Eastern Siberia (favorable climatic conditions, denser population, and well developed agricultural bases).

The production of metallurgical, mining, and chemical equipment should be located mainly in the western sector of Eastern Siberia which, along with the Kuzbass, is the principal base for the development of heavy industry in Siberia. Individual plants producing such equipment, particularly for nonferrous metallurgy, will be developed in the eastern sector of the Zabaykal'ye also. Plants producing equipment for the metalworking and electrochemical industry, construction and road building machinery, and hoisting and transportation equipment must be located mainly in the regions south of the Siberian trunk line. Groups of motor vehicle plants which are especially large consumers of metals, rubber products, wood pulp, and other raw materials should be located near the corresponding raw material supply bases and sources of electric power with the transportation routes taken into consideration, while the motor vehicle assembly plants should be located in Krasnoyarskiy Kray, Irkutskaya Oblast and Eastern Zabaykal'ye.

6. In order to ensure the most progressive trends in the development of machine building in Eastern Siberia it is necessary to create a high concentration of establishments for the mass production of similar machine parts and for performance of similar processes on a large scale. This will make it possible to introduce the technique of mass production even into such branches of machine building having batch and individual production as the manufacture of metallurgical, mining, chemical, construction, and road-building equipment.

An extensive unification, normalization and standardization of units and machine parts and the resultant feasibility of centralization of production of machine parts and units used in various machines related thereto should constitute the basis for organization of machine building in Eastern Siberia. This will, to a great extent, facilitate concentration of production of similar articles at a limited number of plants and maximum centralization of the storage and distribution operation for a group of plants, organization of common bases for casting and forging not only for motor vehicle construction and other mass production industries but also for groups of heavy machine building, chemical, and paper industrial establishments. Certain automotive industrial establishments, such as forge-pressing, casting, stamping, accessory and optional equipment plants, as well as repair shops for technological equipment should be planned as establishments of regional significance, taking into account the requirements of other branches of machine building.

Centralization of the manufacture of mass-produced articles such as gears, electrodes, fasteners, auto-mechanics' tools, spare parts, etc., should be developed extensively in Eastern Siberia.

Such an organization of the machine-building industry will promote the development of cooperation between branches of the industry along with the regional-branch cooperation, according to which the plants belonging to the same branch of machine building are cooperating with one another. As a result, machine building in Eastern Siberia will develop as a system of specialized and cooperating plants.

7. Enormous resources of cheap electric power and the resultant exceptional opportunities for the electrification of production processes afford the introduction of radical changes into the technology of many of the production processes of the machine-building industry, starting with the pre-forming shops. The transfer of thermal processes of smelting, heating, and heat treatment of metals to electrical energy can decrease labor requirements and will be an important factor in the improvement of the quality of production of pre-forming shops. This may be of extreme significance in view of the strained labor conditions in Eastern Siberia, inasmuch as the most important place in machine building will be occupied by the industries based on an extensive application of thermal processes.

8. For a successful development of machine-building industry of Eastern Siberia, its close correlation with the requirements of the national economy, and ensuring its high economic effectiveness it is necessary to evolve a scientifically based plan of the development and distribution of the machine-building industry on the territory of Eastern Siberia as an integral part of the Eastern machine building system.

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## SPECIALIZATION AND LONG-RANGE PLANS FOR THE DEVELOPMENT OF THE MACHINE-BUILDING INDUSTRY OF CHITINSKAYA OBLAST

/By G. Ya. Bam and I. S. Gudim of the Chitinskij Sovnarkhoz,  
pages 33-34.7

Chitinskaya Oblast is an extremely favorable region economically for situating the new machine-building and metal-working plants. This is evident from the fact that Chitinskaya Oblast is located amidst areas of consumption of the machines to be produced, thereby lowering to the minimum the transportation expenses for the delivery of the machines. The proposed construction of a large metallurgical plant in the oblast will afford an ample supply of metal for the machine-building plant, with minimum transportation expenses, thus lowering appreciably the cost of the products of the machine-building plant. The labor force reserves existing in the oblast make it possible to employ over three thousand new men annually. The electrical energy resources of the area afford the supply of a sufficient amount of cheap power to the plant, whereas the existence of native building materials, and technological and electric-power equipment of the railroad stations afford the construction of a number of large machine-building plants with a minimum of capital investment.

In determining the production specialization and the principal trends in the development of the machine-building and metalworking industry of Chitinskaya Oblast, it is imperative that we be based on the actual requirements of the national economy of Eastern Siberia, Zabaykal'ye, and the Far East for their products, and also take into account the specialization achieved in the existing industry and establish the most economical cooperation between the establishments.

In order to exploit the natural resources of the area it is necessary to expand the existing mining establishments and sources of raw materials and to build a number of new large mining establishments and raw material bases for the production of ferrous and nonferrous metals, chemicals, and building materials. A number of large ferrous and nonferrous metallurgical plants, hydroelectric stations and thermal electric stations, oil refineries, machine building and chemical plants, and establishments for the production of building materials are to be constructed.

In order to establish correctly the production specialization and the trends of the development of the machine-building industry in the Chitinskij Economic Region it is necessary to divide the development of machine-building into three periods:

(1) the 1959-1965 period for which the seven-year plan has been drawn up;

- (2) the 1965-1970 period;
- (3) the 1970-1980 period.

During the first period the reconstruction of the existing machine building and metalworking plants in Chitinskaya Oblast must be completed, which fact will appreciably increase production and raise labor productivity with a minimum of capital investment. During the same period a number of new industries which are indispensable for the normal development of the national economy of Chitinskaya Oblast and the neighboring economic regions must be created.

In drawing up the seven-year plan for 1959-1965 the main effort was directed toward the appreciable increase of production by the existing machine-building plants. The increase in the volume of production and the improvement of the economic indexes is planned to be achieved mainly by an increase in labor productivity, better utilization of the existing productive capacities, specialization of the plants, modernization of obsolete equipment and its replacement by improved and more productive machinery, elimination of bottlenecks, and efficient cooperation between the plants. The seven-year plan also provides for the construction of new plants and organization of new industries.

We consider it imperative that during the coming seven-year period a motor vehicle repair shop be built and that overhauling of tractors be also organized there in the future. The necessity has also arisen for the construction of a foundry, which can be achieved with minimum capital investment by utilizing the vacated railroad depot. In addition to this it is necessary to build a powerful forging-pressing shop and a plant for producing construction machines and equipment for the manufacture of prefabricated reinforced concrete units.

The 1965-1970 period has not been thoroughly studied; however, we can judge the development of machine building during this period by taking under consideration the trends and specialization which machine building in the oblast will develop by 1965 and also the trends of the development of the economy of Eastern Siberia and the Far East. The increasing demand for metal, the existence of the richest deposits of iron ores, cheap power and large deposits of coking coal in Southern Yakutiya predetermine the necessity of the construction of a metallurgical plant in Chitinskaya Oblast during this period, which fact will permit a rapid progress in the development of metal consuming machine building industry. During this period, in our opinion, the following plants must be built: (1) road grader, (2) bulldozer, (3) for the production of equipment for cement plants, (4) mining equipment, (5) cutting and boring tools, (6) mechanic's and assembling tools. It is advisable to install these plants at the railroad depots which shall be vacated by that time at the Zilovo and Khilki stations. During this period it is necessary to build at one of the plants a shop producing motor vehicle and agricultural machinery spare parts. In order to decrease the expenses of building construction bases and to decrease the costs of metal structures and optional equipment it will be advantageous to build at one of the plants a shop for the production of optional equipment and metal structures.

The development of metal building during the 1970-1980 period can be outlined only tentatively. In our opinion during this period it will be necessary to construct the following plants: agricultural machinery and tools, motor vehicle assembly, tractor, motor, and machine tool, and also a second foundry.

LONG-RANGE PLANS FOR THE DEVELOPMENT OF THE  
MACHINE-BUILDING AND METAL-WORKING INDUSTRIES OF THE BURYATSKAYA ASSR

By N. V. Titov and V. D. Mayfat of the Buryatskiy Sovnarkhoz,  
pages 35-37.]

The combined expedition of the Academy of Sciences USSR for the study of the productive forces of the Buryatskaya ASSR disclosed the following factors for the development of the metalworking industry of the republic.

1. The advantageous geographical position of the Buryatskaya ASSR which is located at equal distances from the new industrial regions of Western Siberia and the Far East that are now being created.
2. The forthcoming rapid development in the Eastern USSR of branches of industry which furnish their products to machine building and, in their turn, become the latter's consumers (ferrous metallurgy, fuel and power, woodworking, chemical, and other industries), thus making possible the supply of the machine-building establishments of Siberia and the Far East from near by sources and reducing the distances of transportation of the finished products.
3. Long-range plans for the export of the products of machine building industry into the Chinese People's Republic, the Mongolian People's Republic and other Asian countries.
4. The necessity for a more uniform distribution of industry throughout the regions of the country, placing it closer to the sources of raw materials and to the consumers.

The expediency of the development and the creation of new machine building establishments in the Buryat Economic Region is determined by the presence of a number of factors. Among these are the Kyakhta deposits of sillimanite, the close proximity of the Petrovsk-Zabaykal'skaya metallurgical base, the existence of a source of coal, namely, the Gusinoye Ozero, Bayangol', and the high-calory Tugnuy coal, the planned construction of the Gusinoye Ozero regional power plant and of the Khilikskaya hydroelectric station, the exploitation of the lumber works, development of the mining industry, etc. The construction of the Southern Siberian Railroad trunk line will speed up the development of the western regions of Buryatiya, and will create favorable conditions for strengthening the economic connections with the southern sector of Trans-Siberian Kray, Altay, and other regions of Siberia.

The long-range plans for development of the metalworking industry in the Buryat Economic Region is based on the reconstruction of the existing machine-building establishments and not only on construction of new ones. We assume that the specialization of machine

building of the Buryat Economic Region must be developed in the direction of machine tool construction, tool manufacture, motor vehicle and tractor construction, locomotive building, shipbuilding, and the manufacture of metal structures.

At the present time the machine-tool industry is represented by a woodworking machine plant producing the TsKB-4, TsB-3, TsPA, and TsME-2 vertical lathes. It is desirable to specialize the given plant in the production of these models and to complete its reconstruction during 1959-1960, bringing the capacity of the plant to a higher level than planned in the preliminary projects.

The production of tools in the Buryat ASSR is represented by two establishments, namely, by the tool shops of the locomotive-and-car and the machine-building plants. However, since these shops have no specialized equipment, the cost of the tools produced here exceeds the list price 2.5-6 times. Therefore, it is necessary to build a new specialized tool plant.

The long-range plans for the exploitation of minerals on the territory of the republic, development of the massive timberlands, and the growth of the truck transportation will inevitably produce an increase of the active stock of automobiles, trucks, tractors, and other mechanical equipment. This poses the problem of organizing motor vehicle repair establishments and the production of certain spare parts for cars, trucks, and tractors in the Buryat ASSR.

The eastern regions have no base of diesel and electric locomotive construction. From the point of view of the geographical position, the size of capital investment, the existence of a foundry and auxiliary shops, the Ulan-Ude Order of Lenin Steam Locomotive and Railroad Car Plant can become such a base. This plant could be efficiently used for the construction of electric locomotives for which purpose it would be sufficient, without disturbing the technology of the existing industry, to construct an assembly shop for electric locomotives, augmenting it with special equipment. The steam locomotive and railroad car repair program of the plant should be retained but curtailed to the 1955-1956 level.

Shipbuilding in the republic is represented by the Ulan-Ude shipyard which can deliver vessels of various sizes by floating them into the basin of the Selenga River, into the rivers flowing into Lake Baykal and by sailing directly on the lake. According to the plans it is unlikely that the shipyard have sufficient orders for shipbuilding for this basin. Consequently, it must be reconstructed and given sufficient orders for general machine building. In this connection it appears rational to organize here the production of the "Pioneer" type cranes and pneumatically operated cranes.

Mining machine building is totally absent in the republic although the need for it is evident.

In 1953 the planning institute of the Vniazbesttsement (All-Union Scientific Institute of Asbestos and Cement) developed a planning assignment for construction of the Timyuyiskiy foundry and mechanical plant

for supplying the cement industry of the East and Siberia and meeting the requirements of the building materials industry for spare parts, optional equipment, and grinding shafts. The annual program provided for the production of iron, steel, and nonferrous castings, forged (hammered and stamped), boiler, and welded items. It seems that it would be possible, without changing the over-all plan of the plant, to supply optional equipment for the cement plants of the mining industry of Eastern Siberia along with the production of spare parts.

The electrical equipment repair industry in the Buryat ASSR is not organized, although there is a large amount of electrical equipment (transformers, motors, electric telpher lines, generators, magnetic starters, etc.) in the republic. Thus it appears expedient to build a plant for the repair of electrical equipment.

Electric light bulbs are shipped into Eastern Siberia from the Central regions in insufficient quantities and at excessive transportation costs. Therefore, the proposition to build an electric light bulb factory is in our opinion quite correct.

The development of radio and television, the increased demand for electric household appliances calls for the organization of radiotechnical and electrotechnical production for supplying the needs of Siberia and the Far East.

The industry of Buryatiya is a consumer of an appreciable amount of plastics and rubber products both for the industrial and household needs. However, these goods are shipped into the republic from Kemerovo, Sverdlovsk and from the plant of the Center. Therefore, a plant for the production of plastics and rubber goods must be built near the basic source of the raw material, namely, the viscose-cellulose combine.

Food industry is even now occupying an important place in the total volume of the production of Buryatiya. Its further growth will require equipping the plants with more mechanical devices and containers. In the 1958-1965 period a 38% increase in the meat and milk industry has been tentatively outlined for Buryatiya and, if we take into account the increase in the production of these industries in Eastern Siberia and the Far East, we find that the demand for containers will call for situating a new specialized plant here.

In order to liquidate the small disconnected foundries with their inferior technology located at the major portion of the plants in Buryatiya it is necessary to accelerate the operations of reconstruction and increase of capacity of the steel and iron casting shops at the locomotive and car plant.

In addition to this it is necessary to speed up the construction of the fastener plant based on the Petrovsk-Zabaykal'skiy metallurgical plant, since both Buryatiya and Chitinskaya Oblast suffer from a severe shortage of fastenings.

## THE PLACE OF EASTERN SIBERIA IN USSR MACHINE BUILDING

By A. G. Omarovskiy of the NIEI (Scientific Research Institute of Electric Power) of Gosplan USSR, pages 38-41.<sup>7</sup>

The uniform distribution of machine-building industry throughout the areas of the country has a great economic and political significance. Bringing the machine-building plants closer to the sources of raw materials ensures a reduction of the transportation costs, whereas the proximity to the consumers affords a superior adaptation of the design of the machines to industrial conditions. Creation of machine-building plants in the formerly backward and distant regions of the country ensures an improvement of the productive technological and over-all cultural level of the population.

The machine-building industry is located in almost all the economic regions of the country, but its individual branches are unevenly distributed. The majority of specialized metal-cutting tool plants is concentrated in the European sector of the USSR, the production of machines and equipment for light industry in the Center and the Northwest, while the equipment for the food industry is concentrated in the Center and the South. The production of tractors and farm machinery, electric motors, and electrical equipment, metal-working equipment, construction, road building, and a number of other types of machines and equipment is distributed more uniformly.

Uniform distribution of machine building should be interpreted as the most rational disposition of plants in relation to the branches of industry they serve and to the sources of raw materials, and not as a simple dispersal of the plants over the territory of the country.

The long-range planning of the national economy of the USSR for the next 15 years provides for a 2-3-fold increase in the output of the principal branches of industry. In accordance with the assignments for the long-range plan period it is necessary to ensure that the progress of fundamental construction in the eastern regions of the land be faster than in the USSR as a whole. A group of heavy industrial plants, especially the power - and heat - consuming branches, must be built in these regions.

According to the long-range planning, the proportion of industrial potential of the eastern regions of the land will increase appreciably. An important position in this industry will be held by the plants situated in Eastern Siberia. Construction of large power stations entails the building of electrical-equipment and power-equipment plants in Siberia. The establishment of a third coal and metallurgical base, the development of ferrous and nonferrous metallurgy, coal, and

chemical industry render imperative the construction of plants for metallurgical, mining, and chemical machine building, while the growth of freight traffic necessitates the establishment of motor vehicle industry there. The colossal scales of construction carried out throughout vast territory will call for an appreciable amount of construction and road building machines, and it is quite expedient to organize their production in these regions. In addition to this the machine-building industry of the eastern regions must participate in the exportation of machines and equipment to China, India, and other countries in which appreciable industrial reforms are being carried out.

In planning the distribution of large-scale industry advantage is taken of the division of the country into economic administrative regions and also into basic economic regions. In a number of instances, when the problems of the distribution of large groups of industrial establishments are being solved, the country is divided into eastern and western regions. However, at the present-day level of development of the productive forces and, in particular, of the machine-building industry, the division into two zones becomes insufficient. At the present time, when over a hundred economic administrative regions have been created on the territory of the USSR and all the centralized planning is concentrated in Gosplan USSR (which has a relatively small staff), the most rational way is to plan on the level of larger economic-geographical regions, each consisting of several economic administrative regions.

Machine-building plants must be distributed according to the group method. While it is necessary to have almost all the branches of machine building in the large economic zones, in the interior of these zones, in individual industrial centers groups of plants with similar technology and equipment must be established.

During the next 10-15 years appreciable changes in the distribution of the machine building and metalworking industry may occur, especially in the eastern regions of the land, particularly as the result of the construction of new plants in Western and Eastern Siberia, Kazakhstan and the Far East. In the remaining regions the growth of the production of machines and equipment will be mainly achieved by means of a more complete utilization of the existing capacities and the construction of only a few plants, supplementing the existing groups of machine-building industries.

In eastern Siberia and in the Far East the branches of heavy and general machine building, and the production of motor vehicles and farm machinery, should be developed first of all, whereas the organization of production of instruments, tools, and small precise and labor-consuming machines and articles should be relegated to a later period. Among the new establishments we can name plants producing heavy excavators, heavy mining and metallurgical equipment, large castings and forgings, and also a metal structure plant.

In connection with the development of the chemical industry in the eastern regions it is advisable to build several chemical-machine

building plants which would operate in cooperation with other heavy-machine building plants both in the production of castings, forgings, and stampings and in the manufacture of tools, the establishment of a repair base and other auxiliary industries.

In connection with the transfer of railroad transportation to diesel and electric locomotive traction the production of steam locomotives in the USSR has been ceased. However, the present day distribution of diesel and electric locomotive plants is inefficient inasmuch as they are all concentrated in the central and southern regions. Therefore, in the coming years it is necessary to organize the production of electric locomotives and possibly of diesel locomotives in the eastern regions. In order to organize these industries the buildings and personnel of the Ulan-Ude and Krasnoyarsk plants which had been built as steam locomotive plants, can be utilized.

The production of electric power in the USSR during the next 15 years must be increased more than 4 times. The production of electrical and power equipment will increase correspondingly. In connection with the appreciable shift of electric-power production toward the East it would be advisable to build several power-machine building plants in Eastern Siberia.

The production of electrical equipment will increase even at a greater rate. An appreciable proportion of the increase can be achieved by increasing the capacities of the existing plants, however, new plants will also have to be built. About one-half of the latter will have to be built in the eastern regions. A new group of electrical-engineering industry plants can be built in Eastern Siberia and should consist of the following plants: power transformer, large electric motors, high-voltage apparatus, insulators, and welding equipment.

It is expedient to unite these plants into a single group, since they have the following characteristics in common:

- (1) Common area of employment;
- (2) Common testing methods;
- (3) Equipment specialized for the utilization of similar materials; and
- (4) Common specialized pre-forming and service plants and shops, such as casting, forging-pressing, tool, repair, etc.

The development of the motor-vehicle industry is determined by the appreciable increase in the demand for motor vehicles. In the more remote future, when the eastern regions will produce appreciable amounts of metal, plastics, and other materials, it appears expedient to build here a group of motor-vehicle plants consisting of 2-3 main plants with their own design and experimental base, a number of motor-vehicle assembly plants, and a large number of specialized plants for building units, assemblies, and machine parts and also for the production of forged, stamped, and cast billets.

The approximate number of motor vehicle industry plants situated in regions east of the Urals is as follows: motor vehicle assembly -- 5-7, units and machine parts -- 20-25, pre-forming -- 5-6, auxiliary industries -- 5-6, automatic devices -- 8-10, and bearing -- 2-3.

The composite group of motor-vehicle industries created in the eastern regions should consist of separate machine-building groups; for example, in Eastern Siberia two such groups must be formed.

The production of tractors and farm machinery has been established in almost all the economic regions of the land. However further exploitation of virgin and old waste lands in the eastern regions will require the formation of new establishments for farm-machinery building. The sale of tractors and farm machinery to collective farms necessitates an improvement in the distribution of the plants manufacturing these machines as well as spare parts and units for their repair.

Machines and equipment for the food industry of the USSR are manufactured at 80 plants, of which nine only are located in the eastern regions of the country, which is obviously insufficient, especially if we take into account that the plans for these regions include the construction of a large number of food-industry establishments.

Eastern Siberia is one of the largest lumber-industry regions. The lumber and woodworking industry requires a large amount of various equipment for the production of which at least ten plants should be built.

The distribution of plants manufacturing metal-cutting and woodworking equipment and machines and equipment for light and food industries should ensure the formation within the boundaries of individual industrial territorial regions of a composite group of establishments utilizing the advantages of specialization and cooperation and also a single preforming base. The specialized production of billets and fastening blanks, and also of machine parts and units used in general machine building should be developed extensively in Eastern Siberia. In addition to machine-building plants, the industrial-territorial combined groups must include designing and scientific research organizations and educational establishments.

Proceeding from the above facts we can recommend the following combined group of machine building industries for Eastern Siberia:

(1) A group of heavy machine building plants consisting of plants manufacturing excavators, mining and metallurgical equipment, machines and equipment for chemical industry and construction and road building operations;

(2) A group of motor-vehicle industry plants, consisting of several tens of plants specializing in the manufacture of individual pre-formed articles, machine parts, units, and assemblies, as well as an assembly of complete automobiles;

(3) A group of plants for power-machine construction and electrical-engineering equipment industry; and

(4) Plants for manufacturing metal-cutting and woodworking equipment.

The combined group of machine building industry must include service establishment, such as repair shops and tool plants, and scientific research organizations and corresponding educational establishments.

## LONG-RANGE PLANS OF DEVELOPMENT OF CHEMICAL MACHINE BUILDING IN EASTERN SIBERIA

/By S. N. Semikhatov and S. P. Chistyakov, NIIChIMMASH,  
(Scientific Investigation Institute of Chemical Machine  
Building), page 54./

The development of chemical-machine building in Eastern Siberia must be connected with the development of chemical machine building in the Soviet Union as a whole.

Since the chemical industry is the principal consumer of chemical equipment it is obvious that the requirements of the chemical industry will determine the rates of development of chemical-machine building. Calculations show that the over-all requirements for chemical equipment for the seven-year period (1959-1965) will total 2,000,000 tons. A comparison of data of the capacities of establishments, both working and planned, with the tentatively outlined increase of the industry, permits us to establish a grave shortage in equipment during the seven-year period. It would be possible to increase the production and discharge the deficit provided that during 1959 and the ensuing years measures for the execution of the product-technological specialization of the chemical-machine building plants are achieved, the working establishments are fully equipped, the construction of the unfinished plants is completed, other establishments are assigned the manufacture of chemical equipment, and several new chemical machine building plants are built.

At the present time Eastern Siberia is included in the sector of the Russian Federation in which the chemical, oil refining, hydrolysis, forest chemistry, and other branches of industry will develop intensely in the 1959-1965 period of time on the basis of native raw-material resources. The development of the chemical industry in Eastern Siberia will be achieved by means both of the expansion and reconstruction of the working establishments and by building new plants.

It will be expedient to establish in Eastern Siberia the manufacture of synthetic rubber, synthetic fiber, and tires, to build an oxygen plant and hydrolysis plants, to establish a wood-pulp chemistry and petrochemical industry, to build cellulose and paper-and-pulp establishments, and to organize the production of medicines, vitamins, etc. The industrial establishments of Eastern Siberia will be significant consumers of the widest variety of chemical equipment. However, with small exceptions, Eastern Siberia has virtually no machine building base of its own. Therefore, it would be expedient to establish here the production of a certain portion of chemical equipment.

Among the organizations immediately connected with the establishment of chemical-machine building in Eastern Siberia, the Irkutsk Branch of the Designing and Scientific Investigation Institute of Chemical-Machine Building must be the first to be developed.

## LONG-RANGE PLANNING FOR THE DEVELOPMENT OF THE MOTOR-VEHICLE INDUSTRY IN EASTERN SIBERIA

By G. D. Kazakov, GIPROAVTOPROM, (State Institute of Planning  
the Motor Vehicle Industry), pages 60-63.

The Soviet Union lags behind the principal capitalist countries in the size of its fleet of motor vehicles. The quantity and the types of motor vehicles which are now produced in the Soviet Union do not meet the requirements of the national economy.

The volume of goods transported by motor vehicles in the USSR constitutes only 4% of the entire volume of the country's freight as opposed to 26% in France, 22% in the Federal Republic of Germany (FRG), and 18% in the USA. Ninety-two percent of the truck fleet of the USSR consists of trucks of medium load capacity (2.4-4 tons), which are used mainly for the transportation of small loads, which is unprofitable. The percentage of motor vehicles of similar carrying capacity in the fleets of the principal capitalist countries is as follows: in the USA 17%, Great Britain 39%, France 14%, FRG 32%. Only 6.6% of the motor vehicle fleet of the USSR consists of trucks of small carrying capacity (up to 2 tons), while in the fleets of the capitalist countries this type of motor vehicles constitutes: In the USA 73%; Great Britain 58%; France 80%; FRG 58%.

With respect to the number of automobiles in proportion to the population the USSR lags appreciably behind a number of other states. The fleet of buses of the USSR is also inadequate.

According to the control figures of the national economy of the USSR for the 1959-1965 period the production of motor vehicles is scheduled to be increased 1.5 - 1.7 times in 1965 as compared to the 1958 figures. The mean annual increase in the production of motor vehicles during this period will be 9%.

In the long-range planning of the rates and means of the development of the motor-vehicle industry beyond 1965, the following factors must be taken into consideration:

1. In comparing the volume of production of motor vehicles in the USSR and in the principal capitalist states it should be kept in mind that the socialist economic system of the USSR affords an immeasurably more effective utilization of the fleet of trucks and automobiles.

2. The growth of the truck fleet of the country must correspond to the planned increase in freight turnover, with an allowance for the improvement of the indexes of utilization of motor vehicles; at the same time the proportion of 2-ton trucks in the fleet of motor vehicles must be raised to 50-60%.

3. The rates of production of automobiles should be appreciably increased and top priority must be given the production of low- and extra low-powered cars which, because of their moderate price and operating costs, can be afforded by wide sections of the population.

4. The fleet of buses in the country must attain the size that will fill the needs of passenger auto-transportation within the cities and provide extensive intercity bus service.

Proceeding from the above considerations we can tentatively outline the mean annual increase of motor vehicles for the 1966-1975 period: Trucks 10-12%, cars 15%, buses 10%.

At the present time there is practically no motor-vehicle industry in the eastern regions of the land. The plan for the development of the motor-vehicle industry envisages that during the 1959-1965 period it would be necessary to build in the eastern regions of the country only individual motor-vehicle assembly plants and separate establishments for the manufacture of motor-vehicle units and machine parts. The creation of a vast network of spare-part plants (based mainly on other industrial establishments carrying an incomplete load of work) is stipulated by the plan.

We assume that beyond 1965 the development of the motor-vehicle industry in the Eastern regions will proceed in three stages:

The first stage (1965-1970), the establishment of a composite motor-vehicle industry in Western Siberia and the organization of the individual primary industries in Eastern Siberia.

Second stage (1970-1975), the establishment of a composite motor-vehicle industry in Eastern Siberia and construction of individual motor-vehicle plants in the Far East.

Third Stage (after 1975), creation of a composite motor-vehicle industry in the Far East.

During the first stage, the regions of Eastern Siberia and the Far East will receive their supplies of the products of the motor-vehicle industry mainly from the Center and from Western Siberia. In the more remote future, upon the establishment of the motor-vehicle industry in Eastern Siberia, the latter industry must supply the needs of Eastern Siberia and the Far East.

In planning the size of the motor vehicle plants which must be built in the eastern regions it is necessary to take into consideration the volume of motor-freight transportation in the East as compared to the total volume of such transportation in the country as a whole and the expected increase of the population in these regions.

According to the data of Gosplan USSR and Gosplan RSFSR, in 1958 the portion of motor-freight transportation in the eastern regions constituted 14.2% of the total volume of such transportation in the USSR and will retain this ratio through 1965. The share of Eastern Siberia and the Far East in 1958 was 7.5% and in 1965 will attain 7.7%.

The population of Western Siberia, Eastern Siberia, and the Far East on 15 January 1959 was 23,600,000, i.e., approximately 11.3% of the total population of the country. It is assumed that in 1975 the population

of these regions will be 41,000,000 or approximately 15% of the entire population of the USSR. In Eastern Siberia and the Far East these indexes are proportionally equal: On 15 January 1959 -- 5.4% and in 1975 -- 8.7%.

Judging from the data adduced we can assume that the eastern regions must have a motor-vehicle industry with an output of 15-20% of the motor vehicle production of the USSR as a whole, including the 10% produced in Eastern Siberia (for its own needs and for the needs of the Far East).

In order to establish the amount of savings achieved by the national economy as a result of the establishment in Eastern Siberia of the combined production of motor vehicles instead of importation of the latter in a finished state from other regions of the country, it is necessary to perform a preliminary calculation of the possible difference between the cost of production of the motor vehicles and the savings in the cost of delivering them from the plant to the consumer.

At the present time it is impossible to determine the cost of manufacturing motor vehicles and spare parts in Eastern Siberia not only because the factual data on the location of the plants and local prices of raw materials, fuel, and power, etc., is not available, but also because without a detailed examination it is impossible to visualize all the other factors affecting the cost of production (man-hours required for production, amount of deduction for amortization, salaries paid, etc.). At the present time it is possible to calculate only that portion of economic effectiveness which is connected with the costs of transportation of the finished product from the plant to the consumer. These costs per unit of production of the motor-vehicle industry at the going rates for railroad transportation are adduced in the table.

Cost of Delivery of Motor Vehicles and Spare Parts  
to Eastern Siberia and the Far East  
(in Rubles)

<u>From the place of production</u>	<u>Delivery Area</u>	
	<u>Eastern Siberia (Chita)</u>	<u>Far East (Khabarovsk)</u>
Truck of 3 to 4-ton carrying capacity:		
From the Center	2530	3430
From the Urals	1770	2690
From Western Siberia	1160	2140
From Eastern Siberia	440	1370
Truck of 2-2.5-ton carrying capacity:		
From the Center	1790	2470
From the Urals	1340	2030
From Western Siberia	880	1620
From Eastern Siberia	330	1030

<u>From the place of production</u>	<u>Delivery Area</u>	
	<u>Eastern Siberia</u> <u>(Chita)</u>	<u>Far East</u> <u>(Khabarovsk)</u>

**Delivery of 1 ton of spare parts**

From the Center:	440	600
From the Urals:	310	470
From Western Siberia:	200	370
From Eastern Siberia:	80	240

Savings in transportation costs gained by supplying Eastern Siberia and the Far East by the Eastern Siberian motor-vehicle production in comparison to delivery from the Ural regions will equal approximately 200,000,000 rubles annually and in comparison with the delivery from Western Siberia approximately 90,000,000 rubles annually. This amount of economy was computed for the volume of motor-vehicle production scheduled for 1975.

The above adduced reasons and calculations permit us to contemplate for the years prior to 1975 the creation in Eastern Siberia of its own motor vehicle industry with the following annual output of vehicles: trucks 140,000-160,000, cars 80,000-100,000 and buses 8,000-10,000.

The establishment of a motor-vehicle industry in Eastern Siberia must be executed through the construction of a number of specialized, relatively small establishments, the combined group of which will be able to solve the problem of the production of motor vehicles in the above indicated numbers. These establishments must consist of the following plants:

(1) Motor-vehicle assembly plants receiving from the corresponding establishments the basic units and assemblies of motor vehicles; it is expedient that shops producing trailers and semi-trailers be established near the auto-assembly plants.

(2) Plants manufacturing assemblies and separate mass production machine parts for motor vehicles (motors, springs, wheels, stamped machine parts, pistons, pins and bushings, piston rings, valves and pushers, gears and rods, radiators, mechanic's tools, electrical equipment and instruments).

(3) Preforming (forging for the manufacture of heavy forging products, casting for the production of billets and cast machine parts).

(4) Auxiliary, including plants for the manufacture of dies, tools, and optional equipment.

(5) Bearings.

It should be noted that the pre-forming and auxiliary plants must be built in such a manner that they are able to supply the needs of other branches of machine-building establishments of Eastern Siberia, in addition to the motor-vehicle industry.

The over-all annual requirements for metal and tires for the above specified motor-vehicle industry establishments situated in Eastern Siberia will be approximately:

Rolled iron and steel	750,000	tons
Including cold-rolled sheet	120,000	"
Pipes	50,000	"
Ferrous metals (ingots)	220,000	"
Nonferrous metals (rolled and ingots)	50,000	"
Tires (for combined production of vehicles and trailers)	1,600,000	pieces

The specific locations of the individual establishments of the motor-vehicle industry in Eastern Siberia must be determined by the corresponding Sovnarkhozes and the Gosplan of the republic, depending on the planned development of sources of raw materials and power, and transportation facilities after taking into consideration the expected increase of the population of the individual regions.

## DEVELOPMENT OF THE ELECTRICAL-ENGINEERING INDUSTRY IN EASTERN SIBERIA

By L. M. Kanevskiy, Giproenergoprom, (State Institute of Planning the Power Industry), pages 64-67.

The principal trend in the development of technology is electrification. At the present time it would be difficult to name a branch of the national economy in which electric power is not used.

The amount of electrical equipment available to the worker characterizes to a great degree the level of industrial labor productivity; the increase in the technical and economic indexes of railroad transportation is related to its electrification.

The high rates of growth of the production volume and the wide variety of products manufactured are closely related to the vital factors of the electrical-engineering industry which supplies electrical equipment for production, distribution, and consumption of power. Thus, while the increase in the volume of production (growth of the physical volume of gross product) for the 1933-1955 period was 27.2 times for the entire USSR industry and 39 times for the large-scale industry, the volume of the electrical-engineering industry increased 55.5 times. During the 1940-1955 period the volume of production increased as follows: 3.2 times for the entire industry, 3.89 times for large-scale industry, and 6.5 times for the electrical-engineering industry. During the years 1959-1965 the progress of the electrical-engineering industry is expected to advance further ahead of the rates of growth of other branches of industry.

With the formation in Eastern Siberia of the third coal-metallurgical base and the country's largest central power system, a powerful diversified economy is being developed in this region. For the development of power, coal, mining, metallurgical, chemical, woodworking and machine-building industries in Eastern Siberia an appreciable amount of electrical equipment will be required, primarily in connection with the growth of power generators' capacities. However, in computing the requirements for electrical equipment the development of all branches of national economy must be taken into consideration.

In examining the projects for distributing the plant's manufacturing electrical-engineering products in Eastern Siberia we must primarily establish the long-range requirements of the region for these items.

According to the data of the long-range and detailed planning organizations, the production of power in Siberia (Western and Eastern) will attain 200,000,000,000 kwh by 1970. In order to produce this amount of power it will be necessary to introduce annually generators of an over-all 4,000,000 kw capacity.

The cost of electrical equipment (on the average per 1 kw of established output of the power station) is, according to the established ratios, approximately 5,000 rubles.

The utilization of 4,000,000 kw of power per year, its transmission, distribution, and consumption necessitates the annual supply of electrical equipment worth approximately 20,000,000,000 rubles.

Eastern Siberia will consume 65% of all power produced in Central Siberia. In addition to this, in appraising the requirements for electrical equipment it should be kept in mind that over 50% of electric power in Eastern Siberia will be expended by industries consuming great amounts of electric power, where the costs of equipment will be considerably lower. Under these conditions it is evident that in comparison with the average figures the cost of electrical equipment per kilowatt of established output will be decreased by 35-40%.

In deciding upon the distribution of electrical engineering industry in Eastern Siberia it is necessary to take into consideration the following features of this branch of industry:

(1) The development of techniques and technology in the electrical industry is connected with the development of various fields of science and technology, such as atomic and molecular physics, electrical engineering, chemistry, applied mechanics, etc.

(2) The production processes of the electrical industry are rendered more complex as compared to the processes of ordinary machine building by the necessity of using electrical insulation.

(3) The electrical-engineering industry is classed among the labor consuming industries.

Owing to these features an appreciable number of qualified scientific, engineering, and skilled-labor personnel is employed in planning, development of technology, and manufacture of the electrical-engineering goods.

Electrical-engineering plants are usually located in large industrial and cultural centers and only the simplest articles are manufactured in small towns. The rapid progress of the growth of the volume of the production in this branch of industry has been attained mainly through specialization and cooperation. The organization of highly specialized establishments affords the use of mass-production methods, which results in great savings. For example, the man-hours consumed in building a 3-HP electric motor in 1914 was 104 hours, in 1936 -- 44 hours, and in mass production in 1955 -- approximately 3 hours. Therefore, in determining the number and type of plants to be constructed it is necessary to proceed from the condition of further development of specialization and cooperation.

The electric-engineering industry is distinguished by the extensively developed relationship between its branches. Compound transmissions are assembled from articles of different weights, dimensions, and characteristics manufactured in different plants. The inter-branch relationship is determined also by the manufacture of winding wire, insulation materials, and parts at specialized cable, insulation and insulator plants.

Further development of specialization and cooperation requires the construction of plants with a narrowly specialized production. However, this complicates the system of cooperation, whereas the distribution of plants at great distances from one another results in an increase of long-distance transportation, lengthening of the production cycle, and an increasing of the working capital. Therefore, in planning the location of an establishment it is necessary to take into account the inter-branch relationships which are a more important factor in electric engineering industry than the location of sources of raw materials and consumption.

Therefore, it is expedient to establish industrial groups or electrical-engineering combines related to one another with regard to the common consumption of manufactured articles, mutual supply of transmission elements and also by the improved utilization of joint production and services (laboratories, tool shops, shops for the manufacture of optional equipment, standardized machine parts, etc.). On the world scale such industrial aggregates as the Siemens-Schuckert company in Germany and General Electric in the USA are well known. In the USSR there are no such combines. In planning the development of the electric-power industry in Eastern Siberia it is necessary to take into account the features of the adjacent regions of Western Siberia and the Far East as well as the economic ties with the Chinese and Mongolian People's Republics and with other Asian countries.

At the present time in Siberia and the Far East there exist a number of electrical-engineering industry plants whose volume of production will increase 2.6 times by 1965. In Eastern Siberia the electrical engineering industry is but poorly developed. Its active plants will be able to meet only 10-12% of its over-all requirements for electrical-engineering equipment by 1970. The share of transportation costs in relation to the cost of production of electrical-engineering articles is not great and amounts to 3-4%. The location of the sources of raw materials is not of primary importance.

The major portion (by weight) of the production of materials consumed by the electrical-engineering industry is distributed with sufficient uniformity throughout the principal economic zones of the country. The type of the materials utilized is characterized by the following data (in % by weight): standard rolled stock 22.7; iron and steel castings 15.3; transformer steel 18.8; copper 13.7; aluminum 7.1; nonferrous rolled stock 4.0; paper and cardboard 3.1; other materials 5.5. The other materials include mica, varnishes, enamels, and other insulating materials. Transformer steel and certain types of insulating materials are specific to the electrical-engineering industry and constitute about 25% by weight of the total amount of materials used. The use of large quantities of nonferrous metals, such as copper, lead, nonferrous rolled stock, and insulating materials increases the share of their cost in the total cost; however, the freight turnover required for 1,000,000 rubles' worth of electrotechnical-industry production is 40-50% of that in a number of other machine-building industries.

Therefore, in selecting the location of a plant the principal factors should be the distribution of the consumers of the finished products and the supply of supplementary products, and not the proximity of the sources of raw and semi-finished materials (with the exception of the insulator industry).

Other important factors are the existence of labor resources, educational and scientific research institutes and of leading establishments of machine building, metallurgy, and power which use electrical equipment. Taking into consideration all these factors and the specific features of the development of Eastern Siberia, the level of supplying the needs for electrical equipment must be increased by the native products manufactured by the electrotechnical industry in the given region. It is also necessary to develop the production of such articles which will be fully usable in Eastern Siberia and which can be shipped to the Far East and in part exported to Asia. It is not expedient to ship the products westward, since Eastern Siberia has no appreciable advantages over the Central regions with regard to the distribution of the electrical-engineering industry, whereas the labor deficiency will be a serious obstacle in the development of production of labor-consuming goods.

Upon taking into consideration the development of individual branches of industry and the optimum volume of production of electro-technical products in Eastern Siberia, it is most expedient to establish here the plants for manufacturing the following products: turbo-hydro-generators and large machines; power transformers; high-voltage apparatus; electrical equipment; cables, insulators, and electric motors; electric-welding equipment; low-voltage apparatus; electrical insulating materials; and lighting fixtures and electrical fittings.

Giprogor recommends the organization of a group of plants in Krasnoyarskiy Kray. The establishments to be included in this group should produce the following: power transformers; high-voltage apparatus; electrothermal equipment; and cable and electrical insulation materials. The second group should preferably consist of plants for the production of turbo-generators and large-scale machines; electric motors; low-voltage apparatus; electric-welding equipment; lighting fixtures; and electrical fittings and electrical insulation materials. In addition to this, in connection with the electrification of the Siberian trunk line it is advisable to build an electric-locomotive plant based on the steam locomotive plant in Ulan-Ude.

Realization of these measures will permit meeting 50-60% of the general electrical engineering requirements of the regions of Eastern Siberia and the products of its own industry will fully satisfy the need for certain types of these articles.

## LONG-RANGE PLANS FOR THE DEVELOPMENT OF AGRICULTURAL-MACHINE BUILDING IN EASTERN SIBERIA

By Candidate of Economic Sciences A. P. Molotushkina,  
VISKhOM, pages 68-75.

Agricultural-machinery building as a branch of industry is characterized by the following features:

First, by a large variety of items manufactured, comprising at the present time more than 300 types of machines, mechanisms, and devices; by medium or small-scale production (from 3,000 to 30,000 per year); and, mainly, by frequent changes in types. According to statistics, during the last 15 years the average period of production of a single type of machine constituted three to five years. This is explained mainly by the progress in designing agricultural machinery and by the changes in the technology and organization of agricultural production.

Second, by large-scale metal consumption. The percentage of the cost of materials and semi-finished products (mainly metal) constitutes 40-73% of the cost of the machines. The materials are consumed (according to 6 years' data) in the following proportions: rolled stock 61%; grey iron 24%; malleable cast iron 2.8%; cast steel 12.2%.

Third, by the high percentage of metal-working, assembling and welding operations, the share of which in the production of the machines constitutes 30-35% of all labor costs. An exception to the above is the production of tractors, in which the greatest share of labor (40-45%) is consumed by mechanical work and 13-16% by metal-working and assembly operations.

Fourth, by a high degree of specialization: almost 77% of the entire production of tractors and approximately 70% of the production of agricultural machinery in the country are concentrated in this industry. The production of other types constitutes a minor share, not over 6% falls to machine building and 20% to tractor building.

The development of agricultural-machinery building is inseparably linked with the rational distribution of industrial plants. The most important lines based on the principle of distribution of productive forces under socialism entirely preserve their value in this branch. At the same time we must also note certain features determined by the specific character of this branch of industry. The problem of distributing the agricultural-machine building plants is inseparably linked, on the one hand, with the location of metallurgical plants and, on the other hand, with the reform, development, and distribution of agriculture of the USSR.

Locating the agricultural-machinery building industry near the

region of consumption is dependent, firstly, on the undesirability of transporting the machines because of their bulky dimensions. It should be kept in mind that only 26% of the carrying capacity of railroad cars is utilized in transporting of sowers, 35% in transporting combines, and 67% in transporting ploughs. Secondly, a close relationship must be maintained between the manufacturing plant and the agriculture of each individual region in which the machines are to be used on a mass scale, since the conditions of agricultural production are not uniform.

In agriculture the machines are used in composite sets of complete and heterogeneous groups. The type of the group is determined by the character and system of the diversified agricultural production, which, in its turn, depends on the soil, geographic, climatic, and economic factors of the specified region. Therefore, a specific machine type will correspond to each specific agricultural zone and even each individual economic unit.

The socialist method of production ensures the efficient distribution of agricultural-machine building industry. Before the revolution Siberia, Kazakhstan and Central Asia produced only 1.1% of the products of the agricultural-machine industry; prior to the Second World War of 1941 these regions produced 9.9%; and at the beginning of the Fifth Five-Year Plan, 24%. At the present time they yield 27% of the production of the entire agricultural-machine building industry of the USSR. Thus, the post-war distribution of agricultural-machine building in the USSR brought the industry much closer to the regions of consumption and the sources of raw materials.

Combined groups of production of agricultural-machine building have been created in the principal agricultural regions of our country with the exception of Eastern Siberia and the Far East. Agricultural-machine building in the eastern regions is represented by only three plants, two in Eastern Siberia and one in the Far East, of which the only important one is the harvester plant in Krasnoyarskiy Kray. If we inquire whether the needs of such a vast region as Siberia and Kazakhstan as a whole are well supplied with the products of local manufacture we shall find that the available capacities of agricultural-machinery building are inadequate for the requirements of this region, with the exception of grain harvesters, grain sowers, and DT-54 type tractors, almost 70% of which are supplied by the local industry. Consequently, for example in 1957, approximately 150,000 various agricultural machines and tractors were shipped into Siberia and Kazakhstan from the European sector of the Union, including approximately 17,000 items shipped to Eastern Siberia. Such transportation is inefficient since these machines must travel several thousand kilometers before they reach the consumer.

The problem of the development of agricultural-machinery building in Eastern Siberia, which is based on the construction of new plants, extends beyond the limits of the Seven-Year Plan. A preliminary version of the long-range plan provides for this growth of agricultural machine building, as a result of which the agriculture of our country will be

TABLE I

**Future Requirements of Agriculture for Tractors and  
Agricultural Machines as Outlined by Long-Range Plans**

Группа машин	Вся потребность, тыс. штук	2) В том числе				Доля во всей потребности, %	
		5) Западная Сибирь	6) Восточ- ная Си- бирь	7) Дальний Восток	8) Казах- ская ССР	9) Сибирь и Казахста- на	10) Восточная Сибирь
1) Тракторы . . . . .	4036,6	419,6	180,7	90,3	425,9	27,7	4,5
12) В том числе							
13) общего назначения . . . . .	2662,3	312,7	149,0	57,3	323,2	31,7	5,6
14) пропашные . . . . .	1374,3	106,9	31,7	33,0	102,7	20,0	2,3
15) Плуги в однокорпусном исчислении	7000,0	720,0	308,1	103,0	975,0	30,0	4,4
16) Культиваторы на 1 м захвата . . . . .	6050,0	405,0	109,0	64,5	670,0	20,7	1,8
17) Лущильники, боронь, фрезы . . . . .	3560,0	360,0	151,0	53,1	486,0	29,5	4,3
18) Сеялки и сажалки . . . . .	2630,0	238,0	152,5	27,9	341,0	28,9	5,8
19) Машинь для животноводства . . . . .	4940,0	628,0	389,2	126,2	483,0	33,0	7,9
20) Машины для водоснабжения . . . . .	1270,0	155,0	55,1	32,5	161,0	31,8	4,3
21) Погрузочно-разгрузочные средства . . . . .	1130,0	113,0	51,3	18,1	114,0	26,2	4,5
22) Тракторные прицепы и конные тележ- ки . . . . .	2710,0	212,0	107,0	42,0	199,0	20,7	4,0
23) В том числе конные . . . . .	816,0	47,4	29,4	9,8	54,0	17,2	3,6
24) Машины по защите растений . . . . .	550,0	57,5	23,3	6,2	85,5	31,4	4,2
25) Косилки тракторные в однобруском исчислении . . . . .	955,0	132,0	75,8	28,5	174,0	43,0	8,0
26) Косилки конные . . . . .	621,0	90,5	62,7	25,9	36,5	34,7	10,0
27) Грабли тракторные в 6-метровом ис- числении . . . . .	468,0	70,5	42,5	15,0	127,0	54,5	9,1
28) Грабли конные . . . . .	466,0	55,0	45,5	16,5	26,8	30,9	9,8
29) Волокушки, подборщики, стогообразо- ватели, стоговозы . . . . .	226,0	32,0	16,0	3,8	30,0	36,2	7,1
30) Прессы, прессы-подборщики и тюко- подборщики . . . . .	196,5	25,0	12,0	5,0	23,0	33,1	6,1
31) Силосоуборочные и кукурузоубороч- ные комбайны . . . . .	443,0	87,1	34,2	3,0	67,5	43,3	7,7
32) Жатки . . . . .	617,0	97,2	51,7	13,7	96,7	42,0	8,4
33) Комбайны зерноуборочные в 4-х мет- ром исчислении . . . . .	1112,8	141,0	63,0	16,0	171,6	35,2	5,7
34) Чистоочистительные машины . . . . .	267,0	19,3	16,1	4,3	19,4	22,1	6,0
35) Верносушилки . . . . .	80,7	16,2	7,9	2,2	16,3	52,8	9,8
36) Картофелеуборочные машины . . . . .	277,0	19,5	7,2	5,0	7,3	14,1	2,6

LEGEND: 1) types of machines; 2) Specifically; 3) Share of total requirement %; 4) Total requirements in thousands; 5) Western Siberia; 6) Eastern Siberia; 7) Far East; 8) Kazakhstan; 9) of Siberia and Kazakhstan; 10) of Eastern Siberia; 11) Tractors; 12) Including; 13) General purpose; 14) Cultivators; 15) Ploughs, single-bottom; 16) cultivators, 1 meter operating width; 17) Surface ploughs, harrows, rotary hoes; 18) Sowers, planters; 19) Livestock machinery; 20) Water supply machinery; 21) Loaders-unloaders; 22) Tractor trailers and

LEGEND (Table 1 cont'd)

horse draw wagons; 23) Including horse drawn wagons; 24) Vegetation protection machines; 25) Tractor mowers, single-bar; 26) Horse drawn mowers; 27) Tractor rakes, 6 meter operating width; 28) horse drawn rakes; 29) Buckrakes, pickers, haystackers, hayrick carriers; 30) Presses, press-pickers and bale pickers; 31) Silage and corn harvesters; 32) Reapers; 33) Grain combine harvesters, 4 meter operating width; 34) Grain cleaning machines; 35) Grain dryers; and 36) Potato harvester

TABLE 2  
Volume of Future Deliveries of Tractors and Agricultural Machines as Provided in the Long-Range Plan

1) Группа машин	Весь ежегодный объем поставок		2) В том числе			
	руб.	тыс.	в районы Сибири и Казахстана		3) из них	
			млн. руб.	тыс.	руб.	тыс.
<b>4) Тракторы</b>						
10) Общего назначения . . . . .	5100,0	1650,0	1620,0	524,0	285,6	92,4
11) Пропашные . . . . .	2250,0	750,0	410,0	143,0	56,3	18,8
<b>12) Всего . . . . .</b>	<b>7350,0</b>	<b>2400,0</b>	<b>2030,0</b>	<b>667,0</b>	<b>341,9</b>	<b>111,2</b>
<b>5) Сельскохозяйственные машины</b>						
13) Плуги в однокорпусном исчислении . . .	23,4	91,0	70,3	27,2	10,3	4,4
15) Культиваторы на 1 м захвата, лущильники, боронки, фрезы . . . . .	330,1	69,7	88,4	21,0	7,3	2,4
16) Посевные и посадочные машины . . . . .	749,0	222,4	216,5	57,0	43,4	11,4
17) Машины для животноводства . . . . .	516,6	71,2	170,4	23,5	40,8	5,6
18) Погрузочно-разгрузочные средства . . . . .	399,8	86,3	104,7	22,6	18,1	3,9
19) Машины для водоснабжения . . . . .	574,6	72,3	182,8	23,0	24,9	3,1
20) Тракторные прицепы и конные повозки . .	433,0	116,0	89,5	23,9	17,3	4,6
21) Машины по защите растений . . . . .	98,8	17,3	30,4	5,4	4,1	0,7
22) Косилки в однообруском исчислении . . .	155,5	24,8	68,8	10,7	42,4	2,0
23) Грабли 6-метровые . . . . .	77,5	29,4	42,2	18,0	7,0	2,7
24) Волокуши, подборщики, стогообразователи, стоговозы . . . . .	57,0	21,1	20,8	7,7	4,1	1,5
25) Прессы, прессы-подборщики, тюкспедборщики . . . . .	253,9	53,3	84,2	17,7	15,5	3,3
26) Силосоуборочные и кукурузоуборочные комбайны . . . . .	700,3	114,0	303,4	49,4	54,4	8,9
27) Жатки . . . . .	185,9	89,7	78,1	37,9	15,7	7,6
28) Комбайны зерноуборочные . . . . .	2036,6	325,6	717,4	114,8	115,7	18,5
29) Зерносушилки . . . . .	207,3	53,8	45,9	11,9	12,4	3,2
30) Зерносушка . . . . .	186,4	65,3	97,8	34,2	18,5	6,5
31) Картофелоуборочные машины . . . . .	178,9	39,2	25,3	5,5	4,7	1,0
<b>32) Итого . . . . .</b>	<b>7162,6</b>	<b>1592,4</b>	<b>2435,0</b>	<b>508,4</b>	<b>427,2</b>	<b>90,9</b>

**LEGEND:****TABLE 2**

1) Type of machines; 2) Including; 3) Of these; 4) Total annual volume of deliveries; 5) Into Siberian and Kazakhstan regions; 6) Into Eastern Siberia; 7) Millions rubles 8) Thousands tons; 9) Tractors; 10) General purpose; 11) cultivators; 12) Total; 13) Agricultural machines; 14) Ploughs, single-bottom; 15) Cultivators 1 m operating width, surface ploughs, harrows, rotary hoes; 16) Sowers and planters; 17) Livestock machinery; 18) Loaders-unloaders; 19) Water supply machines; 20) Tractor trailers and horse drawn wagons; 21) Vegetation protection machines; 22) Mowers, single-bar; 23) Rakes 6 meter; 24) Buckrakes, pickers, hay stackers, haystack carriers; 25) Presses, press-pickers, bale pickers; 26) Silage and corn harvesters; 27) Reapers; 28) Grain combine harvesters; 29) Grain cleaning machines; 30) Grain dryers; 31) Potato harvesters; 32) Total.

**TABLE 3**  
**Annual Deliveries of Tractors Into Eastern Regions**  
**Specified by the Long-Range Plan**

1) Район	Ежегодная потребность,		3) Поставки, тыс. штук		
	2) сельское хозяйство	прочие отрасли народного хозяйства	из Западной Сибири	из Европейской части СССР	с нового завода Восточной Сибири
4) Казахская ССР . . . . .	47,4	9,5	29,0	27,9	—
5) Западная Сибирь . . . . .	46,5	9,3	16,6	29,1	10,1
6) Восточная Сибирь . . . . .	20,1	4,2	1,9	—	22,4
7) Дальний Восток . . . . .	10,0	2,0	1,0	—	11,0
<b>8) Итого . . . . .</b>	<b>124,0</b>	<b>25,0</b>	<b>46,5</b>	<b>57,0</b>	<b>43,5</b>

**LEGEND:** 1) Region; 2) Annual requirement in thousands; 3) Deliveries in thousands; 4) Agriculture; 5) Other branches of national economy; 6) from Western Siberia; 7) from the European sector of the USSR; 8) from the new plant in Eastern Siberia; 9) Kazakh SSR; 10) Western Siberia; 11) Eastern Siberia; 12) Far East; 13) Total

TABLE 4  
Requirements for Additional Capacities of Agricultural-Machinery  
Building for Siberia and Kazakhstan Producing the  
Principal Types of Machines

1) Машини	2) Ежегодная по- требность, тыс. штук	3) Возможное по- ступление с за- водов Сибири и Казахстана, тыс. штук	4) Возможное по- ступление с за- водов Европей- ской части СССР, тыс. штук	5) Потребность в новых мощностях		
				6) тыс. штук	7) млн. руб.	8) т.м.т(чи- слом в скобках)
9) Плуги в однокорпусном исчисле- нии . . . . .	233,1	230,0	—	—	—	—
10) Культиваторы на 1 м захвата .	140,0	—	21,4	118,6	43,6	13,2
11) Лущильники, боронки, фрезы .	160,0	160,0	—	—	—	—
12) Сеялки и сажалки . . . . .	84,4	84,4	—	—	—	—
13) Погрузочно-разгрузочные сред- ства . . . . .	33,0	—	—	33,0	104,7	22,6
14) Тракторные прицепы, платформы и конные повозки . . . . .	62,1	—	—	62,1	89,5	24,0
15) Машинки по защите растений .	21,7	2,8	—	18,9	26,5	4,7
16) Косилки в однобруском исчисле- нии . . . . .	51,6	—	0,3	51,3	66,9	10,7
17) Грабли 6-метровые . . . . .	31,9	9,6	—	22,3	29,5	11,2
18) Прессы-подборщики, тюкоподбор- щики . . . . .	7,3	2,5	—	4,8	55,4	11,6
19) Силосо-кукурузоуборочные ком- байны . . . . .	24,0	2,0	11,1	10,9	126,4	20,6
20) Комбайны зерновые . . . . .	49,0	45,5	—	3,5	64,0	10,8
21) Сложные зерноочистительные ма- шины . . . . .	7,4	—	—	7,4	45,9	11,9
22) Зерносушушки . . . . .	5,3	0,2	8,1	5,1	94,1	32,9
23) Машинки для животноводства .	163,0	29,8	—	133,2	139,3	19,2
24) Машинки для водоснабжения жи- вотноводческих ферм . . . . .	40,0	3,6	—	36,8	166,5	21,0
25) Итого . . . . .					1052,3	214,4

LEGEND: 1) Machines; 2) Annual requirement in thousands; 3) Possible delivery from Siberian and Kazakhstan plants, in thousands; 4) Possible delivery from the European sector of the USSR (see Note) in thousands; 5) Requirements for new outputs; 6) Thousand; 7) Million rubles; 8) thousand tons (net weight); 9) Ploughs, single-bottom; 10) Cultivators, 1 meter operating width; 11) Surface ploughs, harrows, rotary hoes; 12) Sowers and planters; 13) Loaders-unloaders; 14) Tractor trailers, platforms, horse drawn wagons; 15) Vegetable protection machines; 16) Mowers, single-bar; 17) Rakes, 6 meter; 18) Press-pickers, bale pickers; 19) Silage-corn harvester combines; 20) Grain combine harvesters; 21) Complex grain cleaning machines; 22) Grain dryers; 23) livestock machinery; 24) Machines for supplying water for livestock farms; 25) Total; /Note:/Taking into consideration the possibility of utilizing surpluses of agricultural machinery left over after the requirements of the agriculture of the European sector

LEGEND (Note cont'd)

of the USSR have been fully met.)

TABLE 4

Relative Annual Savings Resulting From the Introduction  
of New Agricultural Machinery

1) Машини	2) Средняя экономия на одну машину в год, тыс. руб.	3) Годовой выпуск дополнительного количества машин или новых машин		4) Экономия от годового выпуска, млн. руб.
		5) тыс. штук	6) млн. руб.	
7) Погрузчики . . . . .	3,2	33,0	104,7	105,6
8) Прицепы и платформы . . . . .	0,14	62,1	89,5	8,7
9) Машины для животноводства . . . . .	1,1	133,2	139,3	153,4
10) Машины для водоснабжения . . . . .	4,5	36,8	166,5	165,6
11) Машины по защите растений . . . . .	1,4	18,9	9,8	28,6
12) Силосоуборочные комбайны . . . . .	1,3	10,9	126,4	14,2
13) Зерноуборочные комбайны . . . . .	14,7	3,5	64,0	51,4
14) Зерноочистки сложные . . . . .	6,1	7,4	46,9	52,1
15) Итого . . . . .			747,1	577,3

LEGEND

- 1) Machines; 2) Mean annual savings per machine in thousand rubles;  
 3) Annual output of additional machines or new machines; 4) Savings from annual output in million rubles; 5) Thousand; 6) Million rubles;  
 7) Loaders; 8) Trailers and platforms; 9) Machinery for livestock;  
 10) Machinery for water supply; 11) Machinery for protection of  
 vegetation; 12) Silage harvesters; 13) Grain harvesters; 14) Complex  
 grain cleaners; 15) Total

saturated with machines of mass application. Thus, according to the long-range plans, the industry must produce a sufficient quantity of machines and tractors to replace the machines rendered inoperative by wear or obsolescence and also to meet the increasing demands resulting from the increase in cultivated areas, numbers of livestock, and the entire volume of all agricultural operations.

In order to determine the requirements for new productive capacities of agricultural-machine building in the East, the volume of the so-called stable production of tractor and agricultural-machine building was established. The computation of this volume was based on the long-term future requirements of agriculture for tractors and principal agricultural machines. The requirements for the latter were determined in accordance with the expanded zones and based on the future volume of operations during the busiest period. The division into zones was performed on the basis of the natural-economic regions recommended by the Council for the Study of Productive Forces of the Academy of Sciences USSR. In selecting the expanded zones the following factors were taken into consideration: the remoteness of the territory, the minimal splitting of the territories of the republics of the Union included in the zones, and the common features of the natural conditions significant in the establishment of the types of the principal agricultural machines.

As a result of calculations by the method adduced, the future requirements of agriculture for tractors and principal agricultural mass-producing machines were obtained for the long-range planning (Table 1).

In order to establish the mean annual stable production and, consequently, the necessary capacities of tractor and agricultural-machinery building and its location, the annual approximated deliveries of tractors and agricultural machines in the zones of the country were computed. The volume of delivery was determined on the basis of the ensuing duration of usage of agricultural machinery and tractors (with wear and obsolescence taken into account): tractors, ploughs, cultivators, sowers, tractor trailers, horse-drawn wagons, machines for the protection of vegetation, and presses and pickers -- 9 years; mowers, reapers, harvesters (for grain, corn, silage, etc.), grain cleaners, grain dryers, and potato harvesters -- 8 years; and animal-husbandry machines, loading-unloading machines, rakes, buckrakes, hayrick carriers, and hay bailers -- 10 years.

The mean tentative price of a machine of a normal series production (not less than 10,000 machines per year) and its weight determine the volume of such machinery to be shipped in, expressed in terms of costs of production of agricultural-machinery building in Siberia and Kazakhstan (Table 2). As we can readily see in Table 2, Siberia and Kazakhstan will consume almost 30% of the entire tractor production and 34% of the principal mass agricultural machines, including the consumption of Eastern Siberia, expressed as 4.5% and 6% respectively. By that time the fleet of agricultural machines will increase 2-3 times and more, and will become for the most part the property of the collective farms. In connection with this the requirements for spare parts, including

entire units and even assemblies (motors, universal joints, gear boxes, etc.), will rise appreciably. The increase in demand will require an appreciable expansion and adjustment of the production of spare parts for tractors and agricultural machines, the volume of which, according to the preliminary computations of Giprotraktorsel'khozmash (State Institutes for Planning the Production of Tractors and Agricultural Machinery) will virtually attain the volume of the basic production of machines.

Spare-parts production should be organized at the plants where similar series machine parts are produced, i.e., at the base tractor and agricultural-machinery plants, thereby cutting the cost of these items appreciably.

For the agriculture of Siberia and Kazakhstan it will be necessary to supply annually a total of 125,000 various tractors, including 20,000 for Eastern Siberia. For industrial, construction, and other needs of the national economy about 20% more will be required, i.e., not less than 25,000 tractors for the regions of Siberia and Kazakhstan, including 4,000 for Eastern Siberia. In order to supply the consumers, the working plants must be supplemented by the construction of a tractor plant, possibly in Eastern Siberia (Table 3).

A total of over 2,400,000,000 rubles' worth of agricultural machines, including trailers, platforms and loaders, will have to be supplied annually for the agricultural needs of Siberia and Kazakhstan; the share of Eastern Siberia will be 427,000,000 rubles. An average of 80% of these needs expressed in terms of cost, can be supplied by the existing industrial capacities (Table 2).

The requirements for new industrial capacities for Siberia and Kazakhstan, even if the excessively distant shipments of a number of agricultural machines is continued, will constitute, without spare parts, more than 1,000,000,000 rubles (Table 4).

Under present-day conditions of complex mechanization of agricultural production, priority in the new construction of agricultural-machine plants must be given plants specialized in the production of loading-unloading and transportation equipment. It is necessary that the production of loading-unloading equipment be organized in the eastern regions with a minimal annual output of 33,000 loaders and 62,000 tractor trailers, platforms, and wagons.

The production of machinery for the mechanization of livestock farms is today an equally important but weakly developed industry. For the production of these machines and equipment which, together with water-supply equipment consist of over 100 different types and therefore require an extremely varied production technology, a number of specialized medium-lot production plants with a total volume of 170,000 machines or sets of equipment must be built. In the eastern regions it is also necessary to organize the production of cultivators, mowers, rakes, silage and corn harvesters, and complex grain cleaning machines, since it does not pay to increase the plant capacities in the European sector and ship these machines to the East. Production of the following machines

should be expanded (either through the construction of new plants or by means of extensive cooperation): machines for the protection of vegetation (based on the Omsk plant), press-pickers and bale pickers (based on the Kurgansel'mash), grain combine harvesters (either based on the further expansion of the capacities of Siberian plants or by utilizing the Pavlodarskiy plant for building harvesters), and grain dryers.

Thus, the following agricultural machine building industries should be organized in Eastern Siberia:

- (1) Loaders;
- (2) Trailers, platforms, wagons;
- (3) Machines and equipment for livestock farms;
- (4) Cultivators;
- (5) Mowers;
- (6) Rakes;
- (7) Silage harvesters; and
- (8) Complex grain cleaning machines.

In the future it will be expedient to create in regions of Eastern Siberia a number of tractor and agricultural machinery plants. These plants will consume annually 760,000 tons of metal (including over 450,000 tons of rolled stock).

After bringing into operation the new agricultural-machinery plants in Eastern Siberia, the average transportation distance for a single machine will be reduced to 28.6-66.7% of the present and over 100,000,000 car-kilometers will be saved annually.

The above enumerated plants will in most instances produce new models. A certain portion of the old models will be used to supply the expanded demands caused by the increase in volume of agricultural work. Therefore, the first years of the exploitation of these agricultural machines will give the national economy additional savings in labor and money (the cost of agricultural products obtained with the aid of these machines will be lower than the cost of medium industry products). The approximate annual volume of these savings is adduced in Table 5.

Agriculture will justify the additional expenses incurred in the purchase of these machines within 1.3 years, and the national economy as a whole, in 2.5 - 3 years.